CLAIMS

1. A matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions;

wherein a difference in height is formed in the boundary between each of the predetermined positions and the periphery thereof, for selectively coating the optical material.

2. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

Sub. B'

forming a difference in height at the boundary between each of the predetermined positions on the display substrate and the peripheries thereof, for coating the liquid optical material; and

coating the liquid optical material at the predetermined positions by using the difference in height.

3. The method of manufacturing a matrix type display device according to Claim 2, wherein the difference in height is formed in a concave shape in which each of the predetermined positions is

lower than the periphery thereof so that the liquid optical material is coated at the predetermined positions with the surface of the display substrate coated with the liquid optical material turned upward.

4. The method of manufacturing a matrix type display device according to Claim 2, wherein the difference in height is formed in a convex shape in which each of the predetermined positions is higher than the periphery thereof so that the liquid optical material is coated at the predetermined positions with the surface of the display substrate coated with the liquid optical material turned downward.

Sub. B' Cont.

5. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a plurality of first bus lines on the display substrate;

forming a difference in height in the boundary between each of the predetermined positions on the display substrate and the periphery thereof, for coating the liquid optical material;

coating the liquid optical material at the

predetermined positions by using the difference in height;

forming a plurality of second bus lines crossing the first bus lines to cover the optical material.

6. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

Sub. B' Con't.

forming a plurality of first bus lines on the display substrate;

forming a difference in height in the boundary between each of the predetermined positions on the display substrate and the periphery thereof, for coating the liquid optical material;

coating the liquid optical material at the predetermined positions by using the difference in height;

forming a plurality of second bus lines on a peeling substrate through a peeling layer; and

transferring the structure peeled off from the peeling layer on the peeling substrate onto the display substrate coated with the optical material so that the first bus lines cross the second bus lines.

7. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming, on the display substrate, wiring including a plurality of scanning lines and signal lines, pixel electrodes respectively corresponding to the predetermined positions, and switching elements for controlling the states of the pixel electrodes in accordance with the state of the wiring;

Sub B' Con't.

forming a difference in height in the boundary between each of the predetermined positions on the display substrate and the periphery thereof, for coating the liquid optical material; and

coating the liquid optical material at the predetermined positions by using the difference in height.

8. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a difference in height in the boundary between each of the predetermined positions on the display substrate and the periphery thereof, for coating the liquid optical material;

coating the liquid optical material at the predetermined positions by using the difference in height;

forming wiring including a plurality of scanning lines and signal lines, pixel electrodes respectively corresponding to the predetermined positions, and switching elements for controlling the states of the pixel electrodes in accordance with the state of the wiring on a peeling substrate through a peeling layer; and

Sub. B' Cont.

transferring the structure peeled off from the peeling layer on the peeling substrate onto the display substrate.

9. The method of manufacturing a matrix type display device according to Claim 5 or 6, wherein the difference in height is formed in a concave shape by using the first bus lines, in which each of the predetermined positions is lower than the periphery thereof; and

in the step of coating the liquid optical material, the liquid optical material is coated at the predetermined positions with the surface of the display substrate coated with the liquid optical material turned upward.

10. The method of manufacturing a matrix type display device according to Claim 7, wherein the difference in height is formed in a concave shape by using the wiring, in which each of the predetermined positions is lower than the periphery thereof; and

in the step of coating the liquid optical material, the liquid optical material is coated at the predetermined positions with the surface of the display substrate coated with the liquid optical material turned upward.

11. The method of manufacturing a matrix type display device according to Claim 7, wherein the difference in height is formed in a convex shape by using the pixel electrodes, in which each of the predetermined positions is higher than the periphery thereof; and

in the step of coating the liquid optical material, the liquid optical material is coated at the predetermined position with the surface of the display substrate coated with the liquid optical material turned downward.

12. The method of manufacturing a matrix type display device according to any one of Claims 5 to 8, further comprising the step of forming an interlevel insulation film;

wherein the difference in height is formed in a concave shape by using the interlevel insulation film, in which each of the predetermined positions

is lower than the periphery thereof; and

in the step of coating the liquid optical material, the liquid optical material is coated at the predetermined positions with the surface of the display substrate coated with the liquid optical material turned upward.

13. The method of manufacturing a matrix type display device according to any one of Claims 5 to 8, further comprising the step of forming a light shielding layer;

wherein the difference in height is formed in a concave shape by using the light shielding layer, in which each of the predetermined positions is lower than the periphery thereof; and

Sub B' Con't.

in the step of coating the liquid optical material, the liquid optical material is coated at the predetermined positions with the surface of the display substrate coated with the liquid optical material turned upward.

14. The method of manufacturing a matrix type display device according to any one of Claims 2, 3 and 5 to 8, wherein in the step of forming the difference in height, the difference in height is formed by coating a liquid material and then selectively removing the coated liquid material.

15. The method of manufacturing a matrix type display device according to any one of Claims 2, 3, 5 and 7, wherein the difference in height is formed on the peeling substrate through the

peeling layer in the step of forming the difference in height, and then the structure peeled off from the peeling layer on the peeling substrate is transferred onto the display substrate.

16. The method of manufacturing a matrix type display device according to any one of Claims 2, 3, 5 to 10, and 12 to 15, wherein the height d_r of the difference in height satisfies the following equation (1):

$$d_a < d_r \qquad \ldots (1)$$

wherein:

d_a: thickness of a single coat of the liquid optical material.

Sub B' Con't.

17. The method of manufacturing a matrix type display device according to Claim 16, wherein the following equation (2) is satisfied:

$$V_d/(d_b \cdot r) > E_t \qquad \ldots (2)$$

wherein:

V_d: driving voltage applied to the optical material;

d_b: total thickness of the liquid optical material coated;

r: concentration of the liquid optical material;

E_t: minimum electric field strength (threshold electric field strength) at which a change in optical properties of the liquid optical material occurs.

18. The method of manufacturing a matrix type display device according to any one of Claims 2, 3, 5 to 10, and 12 to 15, wherein the following equation (3) is satisfied:

$$d_f = d_r \quad \ldots (3)$$

wherein:

d_f: thickness of the optical material at the time of completion.

19. The method of manufacturing a matrix type display device according to Claim 18, wherein the following equation (4) is satisfied:

$$V_d/d_f > E_t \quad \ldots (4)$$

wherein:

V_d: driving voltage applied to the optical material;

E_t: minimum electric field strength (threshold electric field strength) at which a change in optical properties of the liquid optical material occurs.

Sub. B' Cont.

20. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

enhancing the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries

thereof; and

coating the liquid optical material at the predetermined positions.

21. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a plurality of first bus lines on the display substrate;

enhancing the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof;

coating the liquid optical material at the predetermined positions; and

forming a plurality of second bus lines crossing the first bus lines to cover the optical material.

22. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a plurality of first bus lines on the

display substrate;

enhancing the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof;

coating the liquid optical material at the predetermined positions;

forming a plurality of second bus lines on a peeling substrate through a peeling layer; and

transferring the structure peeled off from the peeling layer on the peeling substrate onto the display substrate coated with the optical material so that the first bus lines cross the second bus lines.

23. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming, on the display substrate, wiring including a plurality of scanning lines and signal lines, pixel electrodes respectively corresponding to the predetermined positions, and switching elements for controlling the states of the pixel electrodes in accordance with the state of the wiring;

enhancing the lyophilicity at the

predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof; and

coating the liquid optical material at the predetermined positions.

24. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

enhancing the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof;

coating the liquid optical material at the predetermined positions;

forming wiring including a plurality of scanning lines and signal lines, pixel electrodes respectively corresponding to the predetermined positions, and switching elements for controlling the states of the pixel electrodes in accordance with the state of the wiring on a peeling substrate through a peeling layer; and

transferring the structure peeled off from the peeling layer on the peeling substrate onto the display substrate.

25. The method of manufacturing a matrix type

display device according to Claim 21 or 22, wherein a distribution of high liquid repellency is formed along the first bus lines on the display substrate to enhance the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof.

26. The method of manufacturing a matrix type display device according to Claim 23, wherein a distribution of high liquid repellency is formed along the wiring on the display substrate to enhance the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof.

27. The method of manufacturing a matrix type display device according to Claim 23, wherein the lyophilicity of the surfaces of the pixel electrodes on the display substrate is enhanced to enhance the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof.

28. The method of manufacturing a matrix type display device according to any one of Claims 21 to 24, further comprising the step of forming an interlevel insulation film;

wherein a distribution of high liquid repellency is formed along the interlevel insulation film on the display substrate to enhance the lyophilicity at the predetermined

positions on the display substrate relative to the lyophilicity of the peripheries thereof.

29. The method of manufacturing a matrix type display device according to Claim 23, further comprising the step of forming an interlevel insulation film so that the surfaces of the pixel electrodes are exposed;

wherein in the formation of the interlevel insulation film, a difference in height is formed in the boundary between the portion where the surface of each of the pixel electrodes is exposed and the periphery thereof, for coating the liquid optical material; and

the liquid repellency of the surfaces of the pixel electrodes is enhanced to enhance the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof.

30. The method of manufacturing a matrix type display device according to any one of Claims 21 to 24, further comprising the step of forming a light shielding layer;

wherein a distribution of high liquid repellency is formed along the light shielding layer on the display substrate to enhance the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof.

31. The method of manufacturing a matrix type

display device according to any one of Claims 20 to 30, wherein ultraviolet irradiation or irradiation of plasma of O_2, CF_3, Ar or like is carried out to increase a difference between the lyophilicity at the predetermined positions and the lyophilicity of the peripheries thereof.

32. The method of manufacturing a matrix type display device according to any one of Claims 2 to 19, further comprising the step of enhancing the lyophilicity at the predetermined positions on the display substrate relative to the lyophilicity of the peripheries thereof.

33. The method of manufacturing a matrix type display device according to any one of Claims 20 to 28 and 31, further comprising the step of forming a difference in height in the boundary between each of the predetermined positions on the display substrate and the periphery thereof, for coating the liquid optical material.

34. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a potential distribution on the display substrate so that the potential at each of the predetermined positions differs from the

periphery thereof; and

selectively coating the liquid optical material at the predetermined positions by utilizing the potential distribution.

35. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a potential distribution on the display substrate so that the potential at each of the predetermined positions differs from the periphery thereof; and

coating the liquid optical material at the predetermined positions after charging the optical material to a potential at which a repulsive force is generated between each of the predetermined positions and the periphery thereof.

36. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a plurality of first bus lines on the display substrate;

forming a potential distribution on the display substrate so that the potential at each of the predetermined positions differs from the periphery thereof;

coating the liquid optical material at the predetermined positions after charging the optical material to a potential at which a repulsive force is generated between each of the predetermined positions and the periphery thereof; and

forming a plurality of second bus lines crossing the first bus lines to cover the optical material.

37. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a plurality of first bus lines on the display substrate;

forming a potential distribution on the display substrate so that the potential at each of the predetermined positions differs from the periphery thereof;

coating the liquid optical material at the predetermined positions after charging the optical material to a potential at which a repulsive force is generated between each of the predetermined

positions and the periphery thereof;

forming a plurality of second bus lines on a peeling substrate through a peeling layer; and

transferring the structure peeled off from the peeling layer on the peeling substrate onto the display substrate coated with the optical material so that the first bus lines cross the second bus lines.

38. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming, on the display substrate, wiring including a plurality of scanning lines and signal lines, pixel electrodes respectively corresponding to the predetermined positions, and switching elements for controlling the states of the pixel electrodes in accordance with the state of the wiring;

forming a potential distribution on the display substrate so that the potential at each of the predetermined positions differs from the periphery thereof; and

coating the liquid optical material at the predetermined positions after charging the optical material to a potential at which a repulsive force

is generated between each of the predetermined positions and the periphery thereof.

39. A method of manufacturing a matrix type display device comprising an optical material selectively arranged at predetermined positions on a display substrate, the optical material being liquid at least during coating at the predetermined positions, the method comprising the steps of:

forming a potential distribution on the display substrate so that the potential at each of the predetermined positions differs from the periphery thereof;

coating the liquid optical material at the predetermined positions after charging the optical material to a potential at which a repulsive force is generated between each of the predetermined positions and the periphery thereof;

forming wiring including a plurality of scanning lines and signal lines, pixel electrodes respectively corresponding to the predetermined positions, and switching elements for controlling the states of the pixel electrodes in accordance with the state of the wiring on a peeling substrate through a peeling layer; and

transferring the structure peeled off from the peeling layer on the peeling substrate onto the display substrate.

40. The method of manufacturing a matrix type

display device according to any one of Claims 35 to 39, wherein the potential distribution is formed to charge at least the peripheries of the predetermined positions on the display substrate.

41. The method of manufacturing a matrix type display device according to Claim 36 or 37, wherein the potential distribution is formed by applying a voltage to the first bus lines.

42. The method of manufacturing a matrix type display device according to Claim 38, wherein the potential distribution is formed by applying a voltage to the wiring.

43. The method of manufacturing a matrix type display device according to Claim 38, wherein the potential distribution is formed by applying a voltage to the pixel electrodes.

44. The method of manufacturing a matrix type display device according to Claim 38, wherein the potential distribution is formed by successively applying a voltage the scanning lines, and at the same time applying a voltage to the signal lines, and applying a voltage to the pixel electrodes through the switching elements.

45. The method of manufacturing a matrix type display device according to any one of Claims 35 to 39, further comprising a light shielding layer;

wherein the potential distribution is formed by applying a voltage to the light shielding layer.

46. The method of manufacturing a matrix type display device according to any one of Claims 34 to 45, wherein the potential distribution is formed so that the potential of each of the predetermined positions is opposite to the periphery thereof.

47. The method of manufacturing a matrix type display device according to any one of Claims 2 to 46, wherein the optical material is an organic or inorganic fluorescent material.

48. The method of manufacturing a matrix type display device according to any one of Claims 2, 3, 5 to 10, 12 to 31, and 33 to 46 wherein the optical material is a liquid crystal.

49. The method of manufacturing a matrix type display device according to any one of Claims 7, 8, 10, 11, 13, 23, 24, 26, 27, 38, 39, and 42 to 44, wherein the switching elements comprise amorphous silicon, polycrystalline silicon formed by a high-temperature process at 600°C or higher, or polycrystalline silicon formed by a low-temperature process at 600°C or lower.

Add B2